AMENDMENTS TO CLAIMS

Please cancel claims 1 -- 20. Claims 9 – 20, which were withdrawn in accordance with the election requirement, are also being canceled and have been given the status identifier "canceled".

Please add new claims 21 – 47, which include independent claims 21, 28 and 33.

A complete listing of claims is provided on separate sheets beginning on the following page.

LISTING OF CLAIMS

Claims 1 – 20. Canceled

Claim 21. (New) A method of cleaning a ruthenium-containing deposit from a ruthenium-deposition apparatus, comprising processes of:

providing carbon monoxide (CO) gas in at least a portion of said ruthenium-deposition apparatus during cleaning; and

during cleaning, maintaining at least said portion substantially free of an activated oxygen species and an oxygen-atom donating gas.

Claim 22. (New) A method as in claim 21, further comprising:

avoiding formation of RuO_4.

Claim 23. (New) A method as in claim 21 wherein:

said maintaining at least said portion substantially free comprises purging at least said portion with a purge gas comprising CO; and

wherein said purge gas contains substantially no oxygen-containing oxidizing species except carbon monoxide.

Claim 24. (New) A method as in claim 21 wherein:

said maintaining at least said portion substantially free comprises supplying during cleaning in said portion substantially no species selected from the group consisting of ozone, radical oxygen, a halogen-containing species, nitrogen oxide, and an activated oxygen species.

Claim 25. (New) A method as in claim 24, further comprising:

during cleaning, maintaining at least said portion substantially free of a strong oxidizer.

Claim 26. (New) A method as in claim 21 wherein:

said ruthenium-deposition apparatus comprises at least a portion selected from the group consisting of a ruthenium-deposition reaction chamber, a ruthenium-precursor inlet tube, an inlet manifold, and a reaction-chamber exhaust.

Claim 27. (New) A method as in claim 21, further comprising:

maintaining the temperature of at least said portion of said ruthenium-deposition

apparatus in a range of about from 150°C to 250°C.

Claim 28. (New) A method of cleaning a ruthenium-containing deposit from a ruthenium-deposition apparatus, comprising processes of:

providing carbon monoxide gas in at least a portion of said ruthenium-deposition apparatus; and

avoiding formation of RuO_4.

Claim 29. (New) A method as in claim 28, wherein said avoiding formation of RuO_4 comprises:

during cleaning, maintaining at least said portion substantially free of an activated oxygen species and an oxygen-atom donating gas.

Claim 30. (New) A method as in claim 29, wherein:

said providing carbon monoxide gas in at least said portion comprises flowing carbon monoxide gas through said portion; and

said avoiding formation of RuO_4 comprises supplying during cleaning in said portion substantially no species selected from the group consisting of ozone, radical oxygen, halogen-containing species, nitrogen oxide, and an activated oxygen species.

Claim 31. (New) A method as in claim 30, wherein said avoiding formation of RuO_4 further comprises:

maintaining during cleaning at least said portion substantially free of a strong oxidizer.

Claim 32. (New) A method as in claim 28, further comprising:

during cleaning, maintaining at least said portion substantially free of a ruthenium-containing precursor.

Claim 33. (New) A method of inhibiting formation of a ruthenium-containing deposit on an apparatus surface of a ruthenium-deposition apparatus during deposition of a ruthenium-containing film on a wafer substrate, comprising:

providing a ruthenium-containing precursor gas proximate to a wafer substrate surface in a ruthenium-deposition apparatus to deposit a ruthenium-containing film on said wafer substrate surface; and

providing carbon monoxide (CO) gas proximate to an apparatus surface of said ruthenium-deposition apparatus during said providing said ruthenium-containing precursor gas proximate to said wafer substrate surface.

Claim 34. (New) A method as in claim 33, further comprising:

avoiding formation of RuO_4.

Claim 35. (New) A method as in claim 33, further comprising:

maintaining said apparatus proximate to said apparatus surface substantially free of an activated oxygen species and an oxygen-atom donating gas.

Claim 36. (New) A method as in claim 35 wherein:

said providing carbon monoxide gas proximate to said apparatus surface comprises flushing said surface with carbon monoxide gas; and

said maintaining said apparatus proximate to said apparatus surface substantially free comprises supplying proximate to said apparatus surface substantially no species selected from the group consisting of ozone, radical oxygen, halogen-containing species, nitrogen oxide and activated oxygen species.

Claim 37. (New) A method as in claim 36 wherein said maintaining said apparatus proximate to said apparatus surface substantially free further comprises:

supplying proximate to said apparatus surface substantially no strong oxidizer.

Claim 38. (New) A method as in claim 33 wherein:

said ruthenium-deposition apparatus comprises a ruthenium-deposition reaction chamber and a ruthenium-precursor inlet tube having inlet tube wall surfaces; and

said providing carbon monoxide gas comprises flowing carbon monoxide gas through said ruthenium-precursor inlet tube while flowing a ruthenium-containing precursor gas through said ruthenium-precursor inlet tube.

Claim 39. (New) A method as in claim 38 wherein:

said flowing carbon monoxide gas through said ruthenium-precursor inlet tube comprises flowing a carrier gas comprising carbon monoxide at a carrier gas flow rate;

said flowing a ruthenium-containing precursor gas comprises flowing a ruthenium-containing precursor gas at a ruthenium precursor flow rate; and

a ratio of said ruthenium precursor flow rate divided by said carrier gas flow rate has a value in a range of about from 1/5 to 1/100.

Claim 40. (New) A method as in claim 39, further comprising:

flowing a reactant gas at a reactant gas flow rate through a reactant inlet tube, said reactant gas comprising a gas selected from the group consisting of a strong oxidizer and a reducing gas; and wherein:

said flowing said carrier gas and said ruthenium-containing precursor gas through said ruthenium precursor inlet tube comprises flowing said carrier gas and said ruthenium-containing precursor gas at a combined flow rate; and

a ratio of said combined flow rate divided by said reactant gas flow rate flow rate has a value in a range of about from 1/1 to 1/10.

Claim 41. (New) A method as in claim 33 wherein:

said ruthenium-deposition apparatus comprises a ruthenium-deposition reaction chamber and an inlet manifold connected to said reaction chamber; and

said providing carbon monoxide gas comprises flowing carbon monoxide gas through said inlet manifold while flowing a ruthenium-containing precursor gas through said inlet manifold.

Claim 42. (New) A method as in claim 33, further comprising:

maintaining said apparatus proximate to said apparatus surface substantially free of a ruthenium-containing precursor gas.

Claim 43. (New) A method as in claim 42 wherein:

said ruthenium-deposition apparatus comprises a ruthenium-deposition reaction chamber and a substrate holder having a substrate holder surface located in said reaction chamber; and

said providing carbon monoxide gas comprises flushing said substrate holder surface with carbon monoxide gas while providing a ruthenium-containing precursor gas in said reaction chamber.

Claim 44. (New) A method as in claim 42 wherein:

said ruthenium-deposition apparatus comprises a ruthenium-deposition reaction

chamber having reaction chamber walls; and

said providing carbon monoxide gas comprises flushing said reaction chamber walls with carbon monoxide gas while providing a ruthenium-containing precursor gas in said reaction chamber.

Claim 45. (New) A method as in claim 33, further comprising:

maintaining said apparatus proximate to said apparatus surface substantially free of a reducing agent.

Claim 46. (New) A method as in claim 33, wherein said providing carbon monoxide (CO) gas proximate to an apparatus surface comprises:

providing substantially no oxygen-containing oxidizing species except carbon monoxide proximate to said apparatus surface.

Claim 47. (New) A method as in claim 33, further comprising:

maintaining the temperature of said apparatus surface in a range of about from 150°C to 250°C.